WHAT IS CLAIMED IS:

1. A method for determining the required decoupling capacitors for a power distribution system, the method comprising:

creating a power distribution system model, wherein the model includes a plurality of cells interconnected at predetermined nodes;

selecting one or more decoupling capacitors for the power distribution system, wherein each of the decoupling capacitors is represented by a capacitor model, wherein the capacitor model is a mathematical model of an electrical circuit, the circuit comprising:

a first rail circuit and a second rail circuit, the first rail and the second rail circuit comprising a plurality of inductors in a series configuration; and

a plurality of rung circuits, each rung circuit comprising a resistor and a capacitor in a series configuration, and wherein each rung circuit arranged to electrically connect the first rail circuit and the second rail circuit at distinct nodes;

updating the power distribution model system based on said selecting;

simulating operation of the power distribution system using the power distribution system model;

determining transfer impedance values at each of the predetermined nodes; and

comparing the transfer impedance values at each of the predetermined nodes to a target impedance.

2. The method as recited in claim 1, wherein the power distribution system model and the capacitor model are implemented in circuit simulation software.

3. The method as recited in claim 2, wherein the power distribution system model and the capacitor model are SPICE models.

4. The method as recited in claim 1, wherein the first rail circuit represents a first post of a capacitor and the second rail circuit represents a second post of the capacitor.

5. The method as recited in claim 4, wherein the capacitor includes a plurality of plates connected to the first post and a plurality of plates connected to the second post, and further includes a dielectric material arranged between each of the plurality of plates.

6. The method as recited in claim 5, wherein the first post and the second post are each configured for soldering to a pad on a printed circuit board.

7. The method as recited in claim 1, wherein each of the plurality of inductors represents a portion of the equivalent series inductance (ESL) of the capacitor.

8. The method as recited in claim 1, wherein the resistor of each of the plurality of rung circuits represents a portion of the equivalent series resistance (ESR) of the capacitor.

9. The method as recited in claim 1, wherein the capacitor of each of the plurality of rung circuits represents a portion of the capacitance of the capacitor.

10. The method as recited in claim 1 further comprising repeating said selecting, said updating, said simulating, said determining and said comparing until the transfer impedance value at each of the predetermined nodes is at or below the target impedance.

11. The method as recited in claim 10 further comprising determining transfer impedances for a plurality of frequencies.

12. The method as recited in claim 11, wherein the target impedance is constant over a frequency range of interest.

13. The method as recited in claim 11, wherein the target impedance is a function of frequency.

14. The method as recited in claim 1, wherein the power distribution system includes a printed circuit board having a power plane and a ground plane, and wherein the electrical characteristics represented by each cell of the power distribution system model include attributes of the printed circuit board.

15. The method as recited in claim 14 wherein each of the cells is modeled by electrical characteristics corresponding to one or more transmission lines and one or more resistors.

16. The method as recited in claim 15, wherein each of the transmission lines is characterized by at least one impedance value and at least one time delay value, and wherein the impedance value and the time delay value are based on physical dimensions of the power distribution system.

17. The method as recited in claim 1, wherein the plurality of cells is arranged in an MxN grid.

18. The method as recited in claim 17, wherein M and N are integers of equal value.

19. The method as recited in claim 1, wherein the power distribution system includes a power supply, and wherein the power distribution system model includes attributes of the power supply.

20. The method as recited in claim 19, wherein the power supply is characterized in the power distribution system model by one or more pole frequencies, one or more zero frequencies, and one or more resistances.

21. A system for determining the required decoupling capacitors for a power distribution system, the system comprising:

a computer system configured to:

accept inputs for creating a power distribution system model, wherein the model includes a plurality of cells interconnected at predetermined nodes;

select one or more decoupling capacitors for the power distribution system, wherein each of the decoupling capacitors is represented by a capacitor model, wherein the capacitor model is a mathematical model of an electrical circuit, the circuit comprising:

a first rail circuit and a second rail circuit, the first rail and the second rail circuit comprising a plurality of inductors in a series configuration; and

a plurality of rung circuits, each rung circuit comprising a resistor and a capacitor in a series configuration, and wherein each rung circuit arranged to electrically connect the first rail circuit and the second rail circuit at distinct nodes;

update the power distribution model system based on said selecting;

simulate operation of the power distribution system using the power distribution system model;

determining transfer impedance values at each of the predetermined nodes; and

compare the transfer impedance values at each of the predetermined nodes to a target impedance.

22. The system as recited in claim 21, wherein the power distribution system model and the capacitor model are implemented in circuit simulation software.

23. The system as recited in claim 22, wherein the power distribution system model and the capacitor model are SPICE models.

24. The system as recited in claim 21, wherein the first rail circuit represents a first post of a capacitor and the second rail circuit represents a second post of the capacitor.

25. The system as recited in claim 24, wherein the capacitor includes a plurality of plates connected to the first post and a plurality of plates connected to the second post, and further includes a dielectric material arranged between each of the plurality of plates.

26. The system as recited in claim 25, wherein the first post and the second post are each configured for soldering to a pad on a printed circuit board.

27. The system as recited in claim 21, wherein each of the plurality of inductors represents a portion of the equivalent series inductance (ESL) of the capacitor.

28. The system as recited in claim 21, wherein the resistor of each of the plurality of rung circuits represents a portion of the equivalent series resistance (ESR) of the capacitor.

29. The system as recited in claim 21, wherein the capacitor of each of the plurality of rung circuits represents a portion of the capacitance of the capacitor.

30. The system as recited in claim 21 further comprising repeating said selecting, said updating, said simulating, said determining and said comparing until the transfer impedance value at each of the predetermined nodes is at or below the target impedance.

31. The system as recited in claim 30 further comprising determining transfer impedances for a plurality of frequencies.

32. The system as recited in claim 31, wherein the target impedance is constant over a frequency range of interest.

33. The system as recited in claim 31, wherein the target impedance is a function of frequency.

34. The system as recited in claim 21, wherein the power distribution system includes a printed circuit board having a power plane and a ground plane, and wherein the electrical characteristics represented by each cell of the power distribution system model include attributes of the printed circuit board.

35. The system as recited in claim 34 wherein each of the cells is modeled by electrical characteristics corresponding to one or more transmission lines and one or more resistors.

36. The system as recited in claim 35, wherein each of the transmission lines is characterized by at least one impedance value and at least one time delay value,

and wherein the impedance value and the time delay value are based on physical dimensions of the power distribution system.

37. The system as recited in claim 21, wherein the plurality of cells is arranged in an MxN grid.

38. The system as recited in claim 37, wherein M and N are integers of equal value.

39. The system as recited in claim 21, wherein the power distribution system includes a power supply, and wherein the power distribution system model includes attributes of the power supply.

40. The system as recited in claim 39, wherein the power supply is characterized in the power distribution system model by one or more pole frequencies, one or more zero frequencies, and one or more resistances.